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Earplug technology is an industry leader

by John Schutte, AFRL Human Effectiveness Directorate

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Is the earplug that Carlos Santana wears when he sings Black Magic Woman really the same technology used by U.S. Air Force fighter pilots? Well, almost, thanks to a unique collaboration between the federal government and a commercial hearing healthcare laboratory.

This project by the Air Force Research Laboratory began with earplug technology from Westone Laboratories, Inc. Westone is widely recognized as the industry leader in hearing healthcare products, including in-ear music monitoring devices used by Santana and other top recording artists.

Using the Westone technology as a baseline, AFRL's Human Effectiveness Directorate (AFRL/HE) developed the Attenuating Custom Communications Earphone System (ACCES), which improves hearing protection not only for military ground crews and pilots, but for industrial workers such as construction crews, heavy equipment operators and commercial airline employees.

By integrating specialized electronics and a voice communications cable into a custom-molded earplug, the technology allows clear communications while simultaneously protecting the ear from damaging audio frequencies; that is, above 105 dB SPL (sound pressure level). Even when not under power, ACCES reduces noise by 30 dB. It weighs less than the hard-plastic speakers mounted inside flight helmets and is cost-effective at about $300 per set, depending upon the application. Flight evaluations show that ACCES is comfortable and provides a quiet environment inside a jet.

John Hall, AFRL/HE Science & Technology Lead for Acoustic Signal Control, said the program has leveraged a commercial industry for transition to a military application, and the value-added technology is now being transferred to other commercial applications.

"We partnered with a small business and developed cool technology for both military and commercial markets," Mr. Hall said.

According to Mr. Hall, the Air Combat Command recently approved ACCES for use in fighter aircraft. Previously, pilots and ground crews wore foam earplugs under their communication headsets, which caused problems because the foam plugs muffled all external noise, including important communications.

In September 2005, the U. S. General Services Administration awarded Westone a GSA schedule contract, which allows Westone to market and sell the product directly to military and commercial customers.

"This is a landmark example of technology transfer facilitating transition of products to the warfighter," said Augustine Vu, Air Force Technology Transfer program manager.

AFRL initiated the research upon learning that the Veterans Administration treatment of hearing loss has cost taxpayers more than $5.9 billion since 1977. Air Force maintenance crews also reported problems communicating with each other and with the cockpit when jet engines are in higher power settings.

For Westone, the potential exists to create a new commercial product line with possible applications in the automotive, motorsports and airline industries. The Air Force already has realized the potential for this product in military flight and ground applications.

Mike Melvill, pilot of the rocket plane SpaceShipOne, wore ACCES earplugs during his 2004 flight. Mr. Melvill said he "couldn't have heard anything" without the ACCES technology. Cabin noise reached levels of 120 dB, but Mr. Melvill said his communications with mission control were "perfect," and he had "no discomfort at all from the noise of the rocket motor."

Future improvements could include microphones for two-way communications, and "anti-noise" for improved noise suppression. @